

## YOUR HOME AND THE ENVIRONMENT

**T**hough few of us stop to think about it, our homes, automobiles, and lifestyles affect more than just ourselves; they affect the environment as well. Whenever we make decisions to use less energy or to produce less waste, for example, we are helping everyone around us. This addresses the decisions we face from an environmental perspective. Very often, simple changes in our plans or daily actions are all it takes to lead more environmentally friendly lives.

### Saving Energy Is Good For The Environment

Reducing energy consumption benefits the environment in several ways. Most of the energy we use comes from burning fossil fuels – oil, coal, and natural gas – all of which have significant environmental costs. The most obvious effect is air pollution. Whether these fuels are burned in our cars, in furnaces at home, or in power plants for electricity production, they release many different pollutants into the air, contributing to smog and acid rain. The primary combustion product of fossil fuels – carbon dioxide – was not even considered a pollutant until recently. Although climatologists and other researchers are not in full agreement, the evidence is clear that elevated CO<sub>2</sub> levels in the atmosphere are likely to cause gradual global warming and that human activity does indeed affect the climate.

The environmental impact of fossil fuel use goes beyond the actual burning of the fuels. As reserves of locally available fuels dwindle, we turn to increasingly remote and fragile wilderness areas – from the Amazon Rainforest of Ecuador to the North Slope of Alaska – to quench our thirst for energy. The Valdez oil spill damaged a large area of Alaska's coastline and received a great deal of media attention. But in fact, as many as seven Valdez oil tankers-worth of oil make their way into the groundwater each year just from homeowners dumping waste oil from their cars! (Virginia now has a used oil recycling program. See Chapter 11 for details.)

Nuclear power accounts for 13 percent of Virginia's

total energy use and over 60 percent of its electricity. While nuclear energy is for the most part free from air pollution, the mining and disposal of uranium takes a heavy environmental toll in the western United States. Nuclear waste remains dangerous for at least several hundred thousand years.

Even some renewable energy sources have environmental problems. Wood energy in Virginia accounts for close to 100 trillion Btu's annually, nearly five percent of total energy production. Like fossil fuels, wood combustion releases various air pollutants, including CO<sub>2</sub> (though the CO<sub>2</sub> emissions from burning wood is somewhat offset by the CO<sub>2</sub> absorption by growing trees).

Hydropower is clean in that it results in no pollution, but damming rivers can have significant environmental impact.

The point of all this is that our energy use has substantial environmental costs associated with it, and using less energy is one of the best and most accessible ways to help the environment. By practicing energy conservation in their homes and/or businesses and by using resources more efficiently, consumers can seize the power and exercise their own brand of personal leadership. The cumulative impact of this effort would:

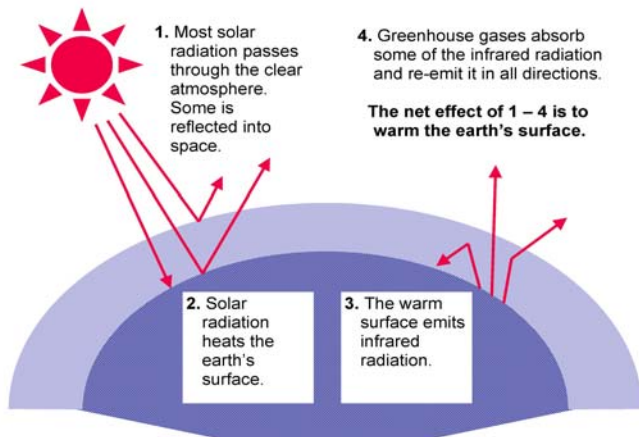
- Conserve our natural resources
- Lower prices by reducing demand
- Preserve the environment by reducing the negative impacts of energy production

Homeowners would also enjoy safer, healthier, more comfortable, and more affordable homes.

### Global Warming

The climate has gradually changed over most of human history. These changes have been a result of natural causes that have occurred over a long period of time – tens of thousands of years. But over the last fifty years human activity has had a profound impact on climate. The increase in our burning of fossil fuels (coal,

## The Greenhouse Effect



*Figure 14-1 - The greenhouse effect can cause global warming*

natural gas, and oil) which emit carbon dioxide into the atmosphere and the release of methane from our landfills has intensified a natural phenomenon called the “greenhouse effect”.

As the energy of the sun heats the earth’s surface much of this energy is radiated back into space. Atmospheric greenhouse gases such as carbon dioxide and methane let sunlight in, but trap thermal radiation and keep it from going back out into space. This process is similar to greenhouse panels that keep heat inside a greenhouse after the warm sun has penetrated the glass. This natural “greenhouse effect” keeps our planet warm, greenhouse gases acting like an insulation blanket. Some level of greenhouse gases are required to maintain the temperatures we’re used to, but an increase in greenhouse gas levels results in a long-term rise in average temperatures. This is called “global warming.”

The Intergovernmental Panel on Climate Change (IPCC), a United Nations group comprised of 2,500 scientists worldwide, the National Academy of Science, and the World Meteorological Organization have all concluded that due to this rapid increase in greenhouse gas, which is caused by human activity, the Earth will witness the fastest rate of warming to occur in the last 10,000 years. The impact of global warming could be widespread and potentially devastating.

The ten warmest years of the 20<sup>th</sup> century occurred after 1980. A warmer climate means that moisture evaporates faster creating severe droughts in some areas and

heavy rainfall in others. This can cause the increased spread of disease, a dramatic rise in sea levels, increased coastal flooding, increased intensity of severe weather events, melting of the ice caps and glaciers, and drastic habitat shifts for plants and animals. Sea levels have risen from 4 to 10 inches over the past century and more than 5,400 square miles of the Antarctic ice shelves have broken off and melted in the past ten years.

What are the solutions and how do we curb the threat of global warming? Simply put, we must reduce the amount of greenhouse gas that is being emitted into the atmosphere. This is difficult to do, because almost all our current energy sources – renewable energy and atomic energy being the exceptions – produce the main greenhouse gas, carbon dioxide. Since the changeover to renewable energy will take time, and atomic energy presents other pollution hazards, the best thing to do right now is to use energy as efficiently as possible.

Every kilowatt-hour (kWh) of electricity that is not used can save from one to over two pounds of carbon dioxide from being emitted into the atmosphere, depending on the fuel type that was used by your utility company to generate electricity. Table 14-1 shows the effect on CO<sub>2</sub> emissions of various energy-saving measures.

Here are some other examples of how reducing energy consumption can minimize carbon dioxide emissions:

- Lowering your thermostat two degrees in winter can save 400 pounds of carbon dioxide (CO<sub>2</sub>) per year in a typical home.
- Not using heat in the drying cycle of your dishwasher can save 200 pounds of CO<sub>2</sub> per year.
- Using cold water to wash clothes can save 500 pounds of CO<sub>2</sub> per year with an electric water heater and 150 pounds per year with gas.
- Keeping your furnace and air conditioner filters clean can save 175 pounds of CO<sub>2</sub> per year.
- Installing low flow showerheads can save 300 pounds of CO<sub>2</sub> per year with an electric water heater and 220 pounds with gas.
- Walking, biking, carpooling, or using mass transit reduces CO<sub>2</sub> emissions. Every gallon of gasoline you save avoids 22 pounds of CO<sub>2</sub> emissions.

**Table 14-1 - Energy Conservation and CO<sub>2</sub> Savings In the Home\***

Energy Conservation Measure	CO <sub>2</sub> Savings (tons/yr) with different energy sources		
	Gas	Oil	Electric <sup>1</sup>
Installing 10 13-watt compact fluorescent light bulbs in place of 60-watt incandescent bulbs <sup>2</sup>	--	--	1.1
Replacing typical 1973 refrigerator with energy-efficient 1998 model <sup>3</sup>	--	--	1.3
Replacing a 65 percent efficient furnace or boiler with one that is 90 percent efficient <sup>4</sup>	2.0	3.0	--
Substituting gas or oil heat for electric resistance heat <sup>1,4</sup>	23.0	19.0	--
Replacing single-glazed windows with low-E, argon-fill double-glazed windows <sup>4</sup>	2.4	3.9	9.8
Planting shade trees around house and painting house a lighter color <sup>5</sup>	--	--	0.9-2.4
Installing solar water heating system <sup>6</sup>	0.8	1.4	4.9
Boosting energy efficiency of house when it is being built from standard insulation levels to super-insulated levels <sup>7</sup>	5.5	8.8	23.0

1. Assumes electricity generated using coal.

2. Assumes lights on 2,000 hours per year (5.5 hours per day).

3. Average 1978 model uses 1,600 kWh per year; energy-efficient 1998 model uses 550 kWh/year.

4. Assumes 1,850 square-foot house of average (good) energy efficiency (heating load of 6.95 Btu/ft<sup>2</sup>/°F-day) in a northern climate (6,300 heating degree-days).

5. Data from Lawrence Berkeley Laboratory, Berkeley, Calif. Based on computer simulations for various locations around the country.

6. Assumes two-panel system providing 14.25 million Btu/year (75% of demand).

7. Assumes 1,850 square-foot house in northern climate (6,300 degree-days). Boosting energy efficiency from 6.95 Btu/ft<sup>2</sup>/°F-day to 1.37 Btu/ft<sup>2</sup>/°F-day (going from R-19 walls, R-30 ceilings, double-glazed windows, and relatively loose construction to R-31 walls, R-38 ceilings, tight construction, and low-E windows).

\*Source: *Consumer Guide to Home Energy Savings*, ACEEE, 1999.

- Wrapping your water heater in an insulating jacket can save 1100 pounds of CO<sub>2</sub> per year for electric water heaters and 220 pounds for gas.
- Insulating your walls and ceiling can save from 1000 to 2000 pounds of CO<sub>2</sub> per year depending on the type of heating and cooling system that is operating.

Using the energy saving techniques discussed throughout this handbook will minimize CO<sub>2</sub> emissions and global warming.

## Houses and the Environment

If you are considering building a new home or making changes to an existing home, there are a number of important environmental issues to consider. Clearly, making your new or remodeled house highly energy efficient is a good idea. But there are other issues to consider as well. The site you choose, the materials you use for construction, the design of your home — these will all have impact on the environment. A few of the issues to consider are listed below.

In making your home more environmentally friendly, don't forget to pay attention to the indoor environment

Many materials used in construction, or even in our day-to-day lives, give off toxic fumes that can accumulate in a house without adequate ventilation. Avoiding these materials when possible and equipping your house with a controlled ventilation system are good steps towards improving indoor air quality (Chapters 2, 10).

### Siting a new house

When choosing the site for a new house (Chapter 10), there are several environmental issues to keep in mind. As undeveloped open space disappears in Virginia, we should consider leaving the undisturbed land alone. In development projects, the practice of cluster housing should be followed where possible — grouping houses on a plot of land, while leaving shared common areas free of structures. In addition to preserving habitats for wildlife, this choice saves energy and resources by shortening roads and utility hook-ups. Renovating a dilapidated old house or tearing it down and rebuilding on the same site are great ways to improve a neighborhood instead of impinging on a natural area.

## Consider the environmental impact of materials

Materials used in construction all have some environmental impact (Chapter 10). Each product or building material you use came from somewhere, went through some type of manufacturing process, and will be disposed of in some way once it no longer serves its purpose. Each nail used in your house, for example, began as raw iron-ore, which had to be mined out of the earth. It was then transported to a mill, processed into steel, molded or stamped into a nail, packaged, and transported to your building site. Each of these steps has an environmental impact. Although our understanding of the environmental impact of building materials is still rudimentary, we already know enough to begin factoring this sort of analysis into our decision making.

### Choose materials with low “embodied” energy

All building materials require energy to produce and transport to the building site (Chapter 10). We call this “embodied energy.” The embodied energy in the materials used to build a house may actually be greater than the energy used to operate the house over its lifetime.

**Table 14-2 - “Embodied energy” in several common building materials (excluding transportation energy).**

Material	Energy for production (Thousand Btu per pound)
Lumber	1 (640 kWh/ton to harvest and process)
Brick	4
Cement	5
Plastic	6
Glass	14
Steel	24
Aluminum	126

Source: *The Natural House*

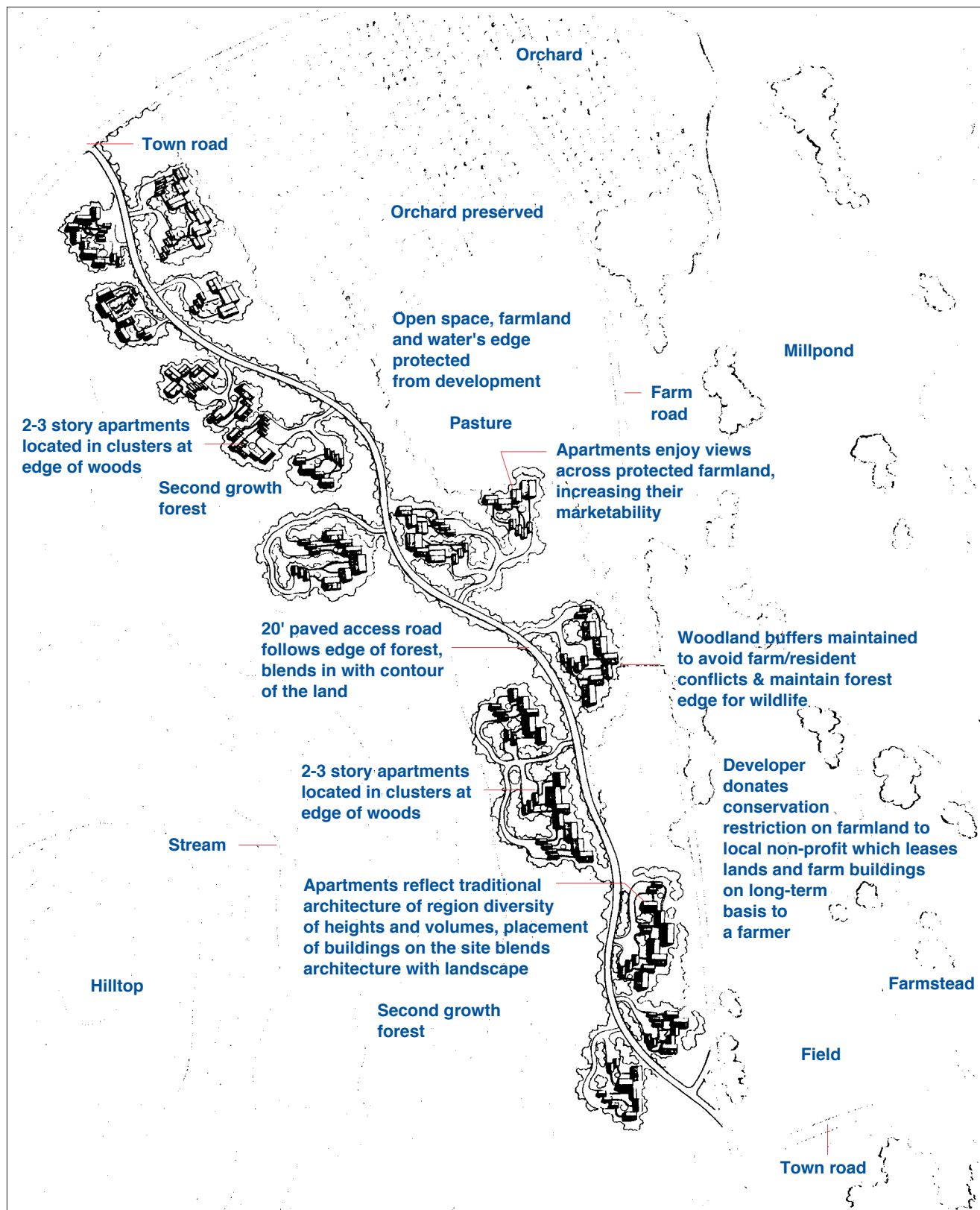


Figure 14-2 - A carefully designed group of homes can offer a sense of "neighborhood," while still preserving the privacy of individual homes and, more importantly, leaving large expanses of surrounding land undeveloped for recreation, agriculture, and habitats of wild plants and animals.



## “HCFCs” (hydrochlorofluorocarbons)

Chlorofluorocarbons (CFCs, Chapter 3) are known to destroy the earth’s protective ozone layer, and they are potent “greenhouse” gases, contributing to the projected global warming. CFC’s have now been banned from use in building materials.

In many cases, however CFCs have been replaced with hydrochlorofluorocarbons (HCFCs). While HCFCs are not as damaging to the ozone layer as CFCs, they still have a bad effect. Because of their detrimental effect on the environment, HCFCs are scheduled for gradual phase-out between now and 2040.

CFCs were used in foam insulating materials, and most of the same materials now use HCFCs. You can get a jump on the 2040 deadline for reducing the HCFC hazard by switching to non-foam insulation or to foams not containing HCFCs.

## Choose locally produced materials when possible

Locally cut and milled softwoods and hardwoods use far less transportation energy than wood products brought in from a great distance, such as plywood shipped from the Pacific Northwest. Use of locally produced materials also helps boost your local economy.

## Avoid materials made from disappearing timber resources

Restrict the use of clear western red cedar, redwood, and cypress to areas where decay resistance is of highest importance. The old-growth forests of these species are quickly disappearing. If siding is to be painted, for example, pine or spruce should be adequate as long as the house or addition is properly constructed (no moisture problems in walls, no splashing on siding, etc.).

## Avoid construction materials with too much packaging

Tell your building products supplier why you are selecting bulk nails, for example, rather than nails in small plastic display containers.

Use products made from recycled materials

Creating markets for recycled materials is the biggest challenge we face in coming to grips with our solid waste problem. You can help out by selecting building products made, at least in part, from recycled materials.

Some building products made from recycled materials have been around for years, such as fiberboard sheathing and cellulose insulation. Other recycled products are just coming onto the market. Examples include wood-plastic composites used in some windows and doors, ceramic tiles made from crushed glass, plastic lumber products for decks and other outdoor exposure wood applications, masonry block and brick made from fly ash, drywall products with high recycled material content, and exterior siding and roofing materials made from recycled fibers and cementitious material. Look for products that advertise the use of recycled materials.

## Use durable products and materials

Manufacturing of almost any material is very energy intensive. A durable product, lasting twice as long as one less durable, will probably not take twice as much energy to produce, so there is a considerable net energy savings (Chapter 10).

## Minimize your use of organic solvent based floor finishes, paints, stains and adhesives

These products release volatile organic compounds (VOCs) into the atmosphere, contributing to smog formation and ground-level ozone pollution (Chapter 2).

## Avoid the use of pesticides and other chemicals that may leach into the groundwater

When backfilling a foundation or grading around a new addition, do not bury cans of solvent, adhesive, paint, or other potentially toxic chemicals (Chapter 10).

## Install water conserving plumbing fixtures

Low-flush toilets, high-quality low-flow showerheads, and faucet aerators not only reduce your water use, but they reduce demand on your septic system or your town’s

water treatment plant. By saving hot water, low-flow showerheads and faucet aerators also save energy. (For more information on water conserving fixtures, see (Chapter 9).

## Recycling Strategies For Your Home

To facilitate recycling in your home, build collection and sorting containers for recyclable materials. Typically it is the kitchen that produces most of the solid waste that comes out of a household, so provide for storage of recyclable materials in or near your kitchen. Instead of leaving the space under the kitchen sink open, for example, you could build bins for bimetal cans, aluminum cans, glass, and general refuse. Consider adding a wall-mounted can crusher so that the area devoted to recycling will not need to be as large.

In your garage, plan a longer term storage area for different colors of glass, different types of plastic (PET,

HDPE, etc.), bimetal and aluminum cans, newspaper, glossy magazines, and recyclable high grade paper.

Check with your local recycling coordinator to find out what products can be recycled locally— and exactly what the requirements are (whether labels and bottle caps have to be removed, how newspaper should be bundled, etc.). Some materials may not yet be recyclable in all parts of Virginia.

If facilities allow, composting of organic waste is another excellent form of inhouse recycling. A small container with a cover near the sink is ideal for collecting organic matter; it should be emptied daily into a composting bin where decomposition can occur. Receptacles are available that mount inside the door below the kitchen sink and lift out for easy transport to your compost bin.

In planning for the future, flexibility is essential, because products and procedures are likely to change as recycling programs mature. With proper planning, it is not difficult to reduce dramatically the amount of waste produced by your household.

Recycling conserves energy and saves on our natural resources. One ton of aluminum from ore requires 16,000-kilowatt hours (kWh) of electricity to process while one ton of aluminum from recycled metal only requires 187 kWh. One ton of recycled paper saves 17 trees. Manufacturing recycled material causes significantly less water and air pollution than producing the same products from raw materials.

## Education is the Key

America is entering the 21<sup>st</sup> century with an unhealthy reliance on 19<sup>th</sup> century fossil fuel technology, which is inefficient, polluting, and a direct contributor to global warming. Home heating oil, propane, and natural gas prices are rising dramatically, and rising fuel prices are in turn causing electricity prices to rise. Emissions from power plants, automobiles and homes are causing dramatic health problems around the country – particularly in the young and the elderly. Our national leadership often focuses on economic costs and the needs of big business while ignoring the environmental costs associated with our current energy situation. Most people don't consider energy and the environment when making decisions about how they live.



*Figure 14-3 - Recycling bins make it easy to sort and store various recyclable materials for delivery to a collection center or curbside pick-up.*

If saving energy saves money, the environment, and saves on our natural resources – then why is conservation not a national daily practice? There is only one answer: lack of education. Effective education on energy and the environment is the key to changing the way people make their energy choices. Once people understand the problem, they naturally make choices that save them money, conserve our energy supplies, and preserve the environment.

Education can eliminate the energy myths that are still so prevalent. Some of these are shown in Table 14-3.

People who believe energy myths like the ones in Table 14-3 hurt not only themselves, but everyone in the community. We can help educate them about sensible energy use by encouraging schools, state and local governments, and public utilities to provide more opportunities for energy and environmental education. We should all take advantage of the educational opportunities (such as this Handbook) that already exist.

Table 14-3 – Typical Energy Myths and Facts

Myth	Fact
Energy conservation is too much of a personal sacrifice. I work hard and make a good living. I have the right to be comfortable.	Wise energy conservation saves energy and saves money without discomfort or inconvenience.
Energy efficient lamps, appliances, and equipment are too expensive. How can I save money if I have to purchase products that are the most expensive on the market?	The day-after-day savings on energy efficient devices can make them an investment that pays back their initial cost many times over.
So what if I can reduce my overall energy bill by 40%! I can easily afford to pay the bill as it stands.	Energy prices are constantly increasing – that wasted energy will cost you more and more as time goes on.
Recycling is a hassle. Landfills are free.	Everyone pays for the cost of landfills through local taxes, and these costs go up as available land decreases.
I want a car with size and power and nobody can tell me I have to drive some little, slow, uncomfortable economy car if I don't want to.	Many fuel-efficient cars are roomy, comfortable, and fun to drive.

## Energy Tips and Recommendations

1. Saving energy is good for the environment because energy production generates pollutants. The less energy we use, the fewer pollutants enter the environment.
2. Saving energy conserves our natural resources for future generations.
3. Homeowners can help to curb global warming by practicing conservation in their homes and by using energy resources more efficiently.
4. Consider the environmental impact of your house by siting a new house properly, by using building materials with low-embodied energy, by using environmentally friendly building materials, and by using products that are durable and long lasting.
5. Develop and implement successful recycling habits and practices in your home.
6. Take the responsibility to learn why it is important to save energy and become educated in how this can be accomplished.